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ABSTRACT

Research on schema theory in general and its specific application to reading in non-native speakers of English has important implications for the second language classroom. Studies show that readings with an unfamiliar background, including an unfamiliar cultural background, are more difficult to understand. Understanding inferences and relationships among different pieces of information is a particular problem for both native and nonnative speakers. In second-language reading classes, this implies that criteria for selecting instructional materials should include the familiarity of the background, especially at lower language proficiency levels. Prereading activities should be specifically designed to activate a schema that will be helpful to the reader. Further research is needed to determine to what extent classroom reading activities can be designed to transfer to reading outside the classroom. Five pages of references are included. (MSE)

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Schema Theory, Reading, and
Second Language Learning

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ABSTRACT

In looking at comprehension, whether reading comprehension or listening comprehension, the traditional assumption has been that these are skills in which the reader/listener passively "takes in" what the writer/speaker has actively produced. However, more recently, it has come to be recognized that what are traditionally referred to as passive skills do require the active participation of the comprehender. The reader/listener's background knowledge interacts with the input for the reader/listener to arrive at comprehension. One theory that has been developed to help explain how readers/listeners interact with the text for the purpose of comprehension is schema theory.

Schemata are highly organized, generic knowledge structures composed of "slots" or "placeholders" for each component. A schema includes information about constraints on what normally can fill a particular slot and what the relationships are among the slots. A schema includes the network of associations that a concept has.

In this paper, I have discussed schema theory, especially as it relates to reading, and then discussed the application of schema theory to second language readers.

Schema Theory, Reading, and
Second Language Learning

Introduction

In looking at comprehension, whether reading comprehension or listening comprehension, the traditional assumption has been that these are skills in which the reader/listener passively "takes in" what the writer/speaker has actively produced. However, more recently, it has come to be recognized that what are traditionally referred to as passive skills do require the active participation of the comprehender. The reader/listener's background knowledge interacts with the input for the reader/listener to arrive at comprehension. One theory that has been developed to help explain how readers/listeners interact with the text for the purpose of comprehension is schema theory.

As far back as Kant (1781), it has been asserted that background knowledge plays a part in comprehension. Bartlett (1932) developed schema theory to explain how background knowledge is used by a reader/listener to understand a text. Bartlett found that when subjects read a story from an unfamiliar culture, their memory of the story changed over time to fit schemata from their own culture. There was relatively little interest in Bartlett's theories and research until the mid-1970's when

researchers again began looking at the influence of background knowledge and the organization of texts on comprehension, particularly reading comprehension.

In this paper, I will look at schema theory, in particular content schemata. I will discuss how these affect reading, and how they affect the reading of nonnative speakers of English in particular. I will review the few studies that have been done on nonnative speakers and conclude with a discussion of schemata and reading in second language learners and recommendations on how what is known about schemata can be applied in the second language classroom.

Schema Theory

Definition of Schema

Schemata are highly organized, generic knowledge structures composed of "slots" or "placeholders" for each component (den Uyl and van Oostendorp, 1980; Anderson, Reynolds, Schallert, and Goetz, 1977). A schema includes information about constraints on what normally can fill a particular slot (Anderson, 1978) and what the relationships are among the slots (Graesser, Woll, Kowalski, and Smith, 1980). A schema includes the network of associations that a concept has (Pearson and Spiro, 1982). This process of filling the slots is called

instantiation of a schema (Anderson, 1978). In addition to information about constraints on what can fill a slot, schemata include "default values" for each slot. Therefore, if no information is available to fill a slot, the reader/listener fills the slot with a value that he/she knows to be typical in that slot. Schemata are hierarchically organized, with most important information at the top, down to the least important information (Anderson, 1978).

Event Schemata

One specialized type of content schema is the event schema, also referred to by Shrank and Abelson (1977) as a script. Like schemata, event schemata are knowledge structures composed of slots labeled according to what may or must fill the slots. Event schemata are about stereotypical events or situations, such as eating in a restaurant or visiting the office of a medical professional. The unique characteristic of event schemata is that they are organized temporally (Schank and Abelson, 1977; Abelson, 1981). Event schemata specify the expected time ordering of events. I will use event schemata to explain how schemata are believed to function.

An event schema (script) for going to a restaurant would include information about servers, menus, paying the

bill, and so on (Bower, Black, and Turner, 1979). The event schema will include the information that there must be a server; that the server can be male or female; that there must be a menu, whether it is a printed menu given to customers or a sign posted on the wall; that the menu will most likely have prices. In addition to a basic restaurant schema, there are restaurant schemata for specific types of restaurants, for example, fancy restaurants, cafeterias, and fast food establishments. These specific event schemata might include the information that in a fancy restaurant, the server is likely to be male and that the prices might be omitted, on at least some of the menus.

Uses of Schemata

Schemata are used mainly in two ways (Bower, Black, and Turner, 1979). The first is in guiding actions in typical situations. For example, a customer entering a restaurant knows how to behave, based on event schemata. The customer knows that, for example, when eating at a sit-down restaurant, the server will give him/her a menu and then leave, that he/she should look at the menu and decide what to eat, and that the server will be back to take the order.

For the purpose of this paper, I am interested in the

second use of schemata--comprehension. Schemata allow the reader/listener to make inferences and fill in information not explicitly included in the text (Anderson, 1978). This makes it unnecessary for a writer/speaker to include every detail that the reader/listener needs to know. The reader/listener makes inferences based on the information that is given and on information from the schema, whether from default values or from relationships that are specified among slots. For example, when eating at a restaurant is mentioned in a text, the reader/listener is able to fill in details that are not specifically mentioned and to make inferences based on the information that is given. If a writer/speaker mentions that there are no prices on the menu, the reader might infer that the restaurant is a very fancy, expensive one. (If you have to ask the price, you can't afford it.)

In summary, schemata are highly organized, generic knowledge structures composed of "slots" or "placeholders" for each component, including information about constraints on what can fill the slot and the relationships among the slots. Schemata are hierarchically organized, from the most general, important pieces of information to more specific, less important pieces.

As part of the process of comprehension, a reader/listener fills in the slots with information from the text and, for slots not explicitly mentioned in the text, with default values or values inferred from other slots. This process is referred to as instantiation of the schema. It is necessary for comprehension, since the writer/speaker does not specify every piece of information necessary for comprehension of a text.

The Application of Schema Theory to Reading

One area in which schema theory has excited a great deal of interest is in the area of reading comprehension. Recently, a considerable amount of research has been done in this area. First, I will discuss the traditional concepts of reading, and then more recent concepts.

Inadequacies of Traditional Concepts of Reading

Models of reading (e.g., Gough, 1972; LaBerge and Samuels, 1974) have been proposed which conceptualize reading as being a unidirectional process from the printed page into the mind of the reader. These models propose, basically, the reading is a process in which symbols are built up into words, words into sentences, and sentences into overall meaning. These reflect traditional attitudes toward reading. This conceptualization treats reading as

what is sometimes referred to as a bottom-up process, because the reader begins with the lowest level, features of symbols, from which the symbols are identified. Strings of symbols are then analyzed into morphological clusters, from which words are recognized, and then strings of words are analyzed into phrases and sentences. The reader thus works up from marks on a page through words and sentences to meaning.

However, many studies of the reading process have produced results that would be impossible to explain in terms of such a unidirectional model. On the symbol level, there are a number of studies that have indicated that identification of letters is influenced by their semantic or syntactic context. For example, Nash-Weber (1975) showed that an ambiguous symbol (which, in isolation, could be identified as either "w" or "ev") would be identified according to the context of the sentence. (See Figure 1.) Also, Reicher (1969) found

Jack and Jill went up the hill.

The pole vault was the last event.

Figure 1--Dependence of letter perception on context
(Nash-Weber, 1975)

that a letter is perceived more accurately when it is part of a word than when it is part of a string of unrelated

letters. Even orthographic knowledge plays a role in letter identification. In a study reported by Rumelhart (1982), subjects were presented with strings of letters, some of which had clusters of letters that were legal in English and some of which had illegal clusters. When asked to name the letters in the string, subjects showed a tendency to transpose illegal clusters to make them legal, though they rarely transposed legal clusters to make them illegal. These studies and others indicate that identification of letters depends on higher level knowledge.

Further, perception of words is facilitated by their syntactic and semantic environments. Kolars (1970) analyzed substitution errors (errors in which an incorrect word is substituted for a correct one) made by adults in reading aloud. If the reading comprehension process is unidirectional, it would be expected that errors would be strongly influenced by visual similarity to the correct word. However, Kolars found that, in 70% of the cases, the substitutions errors were the same part of speech as the correct word. (Eighteen percent would be expected by chance.) In similar studies, Weber (1970) found that, in 90% of the cases, first graders' reading errors fit grammatically with the text up to that point,

and Stevens and Rumelhart (1975) found that 98% of the substitution errors recognizable as words were grammatically correct in the sentence. Also, Meyer and Schvaneveldt (1971) found that subjects identifying pairs of words could identify the second word faster if it was semantically related to the first word, (e.g., "nurse" was easier to identify if it followed "doctor" than if it followed "bread"). The results indicate that word recognition is facilitated by higher level knowledge.

Lastly, sentence comprehension is facilitated by knowledge of semantics and the context in which it is found. Schank (1973) found that ambiguous sentences tended to be interpreted based on the reader's semantic knowledge (e.g., "I saw the Grand Canyon flying to New York" was interpreted as "I saw the Grand Canyon while I was flying to New York" rather than "I saw the Grand Canyon which was flying to New York.") Words with multiple meanings are interpreted in terms of the context in which they appear (Rumelhart, 1982). Bransford and Johnson (1973) found that a sentence was much more likely to be remembered if it was meaningful in the context in which it was found than if it was meaningless. They interpreted these findings to indicate that context is used in interpreting sentence meaning, and a sentence that does not fit the

context may be difficult or impossible to understand, even if it is syntactically and semantically correct.

In summary, all of these studies show that lower level processes--the identification of words and letters--are influenced by higher level processes--sentence comprehension and knowledge about the context. A conceptualization of reading must take into account the fact that the reading process makes use of top-down processing.

Top-Down Processing in Reading

Goodman (1967, 1970) was among the first to spark the recent interest in reading as a top-down process, rather than a bottom-up process. In this conceptualization of reading, the process is viewed as one in which the reader makes use of higher-level knowledge in order to comprehend lower-level structures. Goodman characterized reading as a "psycholinguistic guessing game" in which the reader makes predictions and then samples input to confirm or disconfirm the predictions.

The reader is not confined to information he receives from a half inch of print in clear focus....The reader uses syntactic and semantic information as well. He predicts and anticipates on the basis of this information, sampling from the print just enough to confirm his guess of what's coming, to cue more semantic and syntactic information. Redundancy and sequential constraints in language, which the reader reacts to, make this prediction possible (Goodman, 1970: 131).

According to Goodman, what happens "behind the eye" is as important as what is on the printed page. Goodman focused on how the reader's syntactic and semantic knowledge assists in the process of reading comprehension. More recently, researchers have expanded this focus to include ways that both background knowledge and knowledge of discourse constraints assist comprehension.

A considerable amount of research has been done over the past decade on how reading comprehension is influenced by content schemata. A number of studies have been done on native English speakers showing that readers demonstrate significantly better comprehension of texts for which they have greater background knowledge (e.g., Spiro, 1980; Taylor, 1979; Langer and Nicolich, 1981; Langer, 1984; Kintsch and Greene, 1978; Hare, 1982), or which fit schema that they have (e.g., den Uyl and van Oostendorp, 1980; Haberlandt, Berian, and Sandson, 1980; Anderson, Spiro, and Anderson, 1978). Bransford and Johnson (1972) found that, when readers had no schema for a text, they recalled it significantly less well than if they did. Kozminsky (1977) showed that, when the title of a text caused the reader to activate one particular schema rather than another, readers tended to comprehend the text from the perspective of the schema suggested in the title.

Taylor (1979) and Eamon (1978-1979) did studies on differences between the ways that good and poor readers use schemata. Using third and fifth graders, Taylor found that both good and poor readers had better comprehension of familiar material. However, the difference was significantly greater for unfamiliar material. This indicates that poor readers are able to use top-down processing when material is familiar, but that they resort to bottom-up processing when the material is unfamiliar. Taylor did not speculate on how good readers were processing the texts. However, assuming that there actually were no differences in the familiarity of the texts, it appears that good readers were actually using some form of top-down processing. Possibly they were using either more general content schemata or textual schemata.

Eamon (1978-1979) found that good readers were able to recall information of direct relevance to the text than material that was less relevant. In contrast, for poor readers, there was less difference between memory for relevant and irrelevant material. This indicates that good readers use schemata better than poor readers do.

All of these studies demonstrate the importance that content schemata have in reading comprehension.

Content Schema and Second Language Readers

As with first language readers, the traditional emphasis has been on the language to be comprehended and not on the person doing the comprehending.

In these essentially 'linguistic' views of comprehension each word, each well-formed sentence, and every well-formed text 'has' a meaning. Meaning is conceived to be 'in' the text, to have a separate, independent existence from the reader. Failures to comprehend a nondefective text are viewed as being due to language-specific deficits--perhaps a word was not in the reader's vocabulary, a rule of grammar was misapplied, an anaphoric cohesive tie was improperly coordinated, and so on (Carrell, 1984b: 332).

The recent interest in reading and schema theory among first language reading specialists has attracted the attention of second language reading teachers and researchers. Second language reading theorists are coming to recognize that what the reader knows is as important as what is on the page.

Research on Second Language Learners

A number of studies have been done with second language learners in relation to reading and schema theory, using both content and textual schemata. The results of these studies are sometimes difficult to compare, because of the differences in subjects, sets of variables, and techniques used. Also, none of these

studies have been replicated. However, they can hopefully shed some light on how or whether second language learners make use of schemata in reading. In this section, I would like to discuss the studies and the implications they have about second language readers' use of schemata.

A study by Steffensen, Joag-Dev, and Anderson (1979) did not use language specifically as a variable, since the subjects were American native English speakers and Indians (natives of India) whose English proficiency was very high. However, the study did address the issue of cultural differences in background knowledge and how this knowledge assists or interferes with comprehension.

The researchers had American and Indian participants read descriptions of weddings from their own culture and from the other culture and then write descriptions of the weddings. Members of both groups read the description from the other culture more slowly than the one from their own. They not only remembered more details of the wedding in their own culture and remembered them more accurately, they were able to draw correct inferences from the description of the wedding in their own culture. This would tend to indicate that the readers were making use of a schema for weddings in storing the text in memory and in interpreting the meaning of the text.

Subjects also often drew incorrect inferences from the description of the wedding from the other culture, based on the schema for weddings in their own culture. For example, the description of the American wedding included a mention that the bride wore her grandmother's wedding gown. An Indian subject reported, in the recall protocol, that the dress was, unfortunately, old and out of fashion, a comment which would fit the Indian schema that it is important for the bride's family to show their economic status by providing a new, fashionable wedding sari for the bride to wear. American readers, in contrast, emphasized the aspect of family tradition involved in the bride wearing her grandmother's dress, which fits with the schema for American weddings. Apparently when readers do not have an appropriate schema (as the Indian readers did not have a schema for American weddings) they interpret input according to the most similar schema that they do have (i.e., the schema for Indian weddings).

In addition, recall protocols were often vague in areas where readers did not have schemata. For example, the text on the Indian wedding contained details about the gifts exchanged by the families. Indian respondents not only tended to remember what the gifts were, they

commented on the significance of the gifts. In contrast, descriptions by Americans were vague and did not include any information about the significance of the gifts.

This study is an indication that, even in the native language or a strong second language, the reader's knowledge of the schematic background of a text greatly aids comprehension. In addition, lack of an appropriate schema for a text hampers accurate comprehension. It is likely to be even a more serious problem for readers of a second language who have a less-than-adequate language proficiency.

Though some second language reading teachers have long recognized that their students were better able to deal with culturally familiar material (Carrell, 1983c), it was not until the 1980's that this was empirically tested.

Studies of second language readers' ability to comprehend a text have traditionally focused on such factors as lexical difficulty and sentence length and complexity. However, when Johnson (1981) investigated the effects of text complexity and cultural background on comprehension, she found that, for second language readers, cultural background had a greater effect on ability to understand the text than did semantic and

syntactic complexity.

Johnson had American subjects and intermediate and advanced Iranian subjects read simplified or unsimplified versions of two passages, one based on American folklore and one on Iranian folklore. For Iranians, she found an interaction between cultural background and language complexity for the total number of events recalled. More events were recalled from the simplified American story than from the unsimplified one, though there was no difference for the Iranian story. However, she did not find an interaction between language complexity and cultural background or a main effect for language complexity when she measured inferences made from the texts. Iranian participants produced more inferences from the culturally familiar story than from the unfamiliar one, regardless of language complexity.

Americans remembered more propositions from the American story, and more from the unsimplified stories, raising the possibility that the structure of adapted texts is somehow different from the text structure that native speakers are accustomed to. Like the Iranians, Americans produced more inferences from the culturally familiar story than the unfamiliar one.

The content schema variable may have been confounded

in this study by a textual schema variable. Possibly knowledge of the textual schemata, the conventionalized arrangement of the events and themes in a story, had something to do with the fact that readers understood the folktale from their own culture better.

The results of this study indicate that Iranian second language readers do make use of schemata, whether content schemata or textual schemata, at least in reading narratives. Also, schemata seem to be more important than language complexity in making inferences from the text, though simplified language seems to be helpful in comprehending the events in the story.

Carrell (1983b) looked at the effects of three components of background knowledge: prior knowledge (familiar vs. novel), prior cues to the content of the text (context vs. no context) and the degree to which lexical items reveal the content area (transparent vs. opaque). Her subjects, who were native speakers of English and high-intermediate and advanced nonnative speakers, included students from a variety of countries, but they were primarily Malaysians. In a $2 \times 2 \times 2$ design, Carrell used the variables of context (providing or not providing and title and picture), transparency (presence or absence of vocabulary that provided cues to

the content area) and familiarity (presence or absence of prior knowledge about the content). For the advanced group of students, familiarity was the only significant variable. More was recalled from the novel text than the familiar text. For the high-intermediate students, significantly more was recalled from the transparent version than the opaque version. All three variables affected the recall of native speakers.

Carrell concluded that native speakers make use of contextual cues to do top-down processing and lexical cues to do bottom-up processing, and that, at least in short term memory, novel information is more memorable. Nonnative speakers, on the other hand, do not make use of context or textual cues. They are not particularly proficient at either top-down or bottom-up processing. If this study has any external validity at all, it raises the question of how the advanced students, who were attending regular university classes, were managing the reading required in those classes.

One flaw in this study is operationalization of the familiar/novel variable. As a familiar text, Carrell used a description of the procedure for washing clothes. The largest number of subjects in this study were Malaysians. However, according to a Malaysian informant, some of the

steps in the procedure as it is described in the text would not have been familiar to Malaysians. For example, the writer of the text mentioned the possibility of going somewhere outside of the home to wash clothes. Malaysians do not use laundromats in Malaysia. Also, the writer mentioned dividing clothing into different groups according to color. This is another thing that Malaysians do not do, except in fairly rare cases of clothing whose colors might run (personal communication, I. Abubaker, June 1, 1987). Therefore, the supposedly familiar text may have been at least partly novel. This may be a case where the nonnative speakers did not have an appropriate event schema, rather than one where they are not able to activate a schema that they already had. This points up a problem in doing schema research with nonnative speakers. When measurement indicates that second language readers have not made use of schemata, the question arises of whether the problem is that they do not have the necessary schema, that they have not activated the schema that they have, or that they have activated an inappropriate schema. This will be discussed in detail in the following section.

As far as I could find, only one study has actually been done on use of content schema in the classroom with second language readers. Hudson (1982) looked at the

effects of different prereading exercises intended to activate schemata on the reading performance of beginning, intermediate and advanced students, primarily Iranians. In one condition, students were shown pictures related to the text, which they discussed. Afterwards, students privately generated predictions about the content of the text. In the second condition, students were given a list of vocabulary words and definitions. Both of these groups answered questions about the content of the text. In the third condition, students read the text, answered questions about it, read the text again, and answered the same questions again. Scores were significantly higher for the first condition for beginning and intermediate students. There was no difference for advanced students. Hudson interpreted this to indicate that advanced readers were able to activate schemata without outside help, but at the lower levels, some help in activating schemata was necessary.

While this study does indicate that prereading exercises are of some use to beginning and intermediate students, it is not clear from the study what aspects of the prereading exercise was effective in activating the schema. In the first condition, subjects saw pictures related to the story, they discussed what was in the

pictures, and they generated predictions. This raises a number of questions. Was it one of these three steps that activated the schema, or an interaction of the three? Would, for example, studying the pictures alone, without discussing them, have produced the same results? Was generating predictions a necessary part of the process? Would generating predictions have been sufficient alone? Further research to clarify the answers to these questions would be useful.

Also, since there was no control group that did not receive any treatment, we do not know how the treatments Hudson used compared with no treatment at all, though the assumption probably would be that groups with no treatment would not have done as well as students in the first condition. If that assumption is correct, this study indicates that it is inadvisable to let students at the intermediate level or below read a text "cold".

Implications of Research

Based on these studies, it appears that concern about linguistic difficulty of texts is at least partially misplaced. In addition to lack of adequate linguistic proficiency, lack of appropriate schemata related to a text, or inability to make use of the schemata, can be sources of serious problems in comprehension. Also,

second language readers do make some use of the schemata that they have in second languages, though they seem to do so less well than native speakers do. Carrell's (1983b) study tends to contradict this conclusion. However, there are questions about the operationalization of familiarity in her study that make her conclusions questionable. Nonnative speakers do seem to have difficulty reading material that is not culturally familiar.

A prereading technique involving looking at pictures, discussing the pictures, and privately predicting what will a text will be about seems to be useful in activating schemata for nonnative speakers. However, due to confounding of the variables in this study, it is not possible to determine which of the three steps, or combination of steps, in the prereading activity produced the effect.

Much more research is needed in the area of second language reading and schema theory and how these apply to the classroom before definitive conclusions can be reached in this area.

Measurement Issues

In reading and schema research with nonnative speakers, there are special issues related to measurement. These include: 1) how to measure background knowledge,

2) how to measure comprehension of the text, and 3) how to determine whether a schema has been activated. These problems have not generally been dealt with in literature related to second language readers. In this section, I would like to look at how research done on both native speakers and nonnative speakers applies to this issue. While it is necessary to be cautious in such applications, results from research with native speakers can at least give some indication of possible solutions for the problems peculiar to nonnative speakers. In this section, I will also make some suggestions about methodological standards for research done in the area of reading and schema theory with nonnative speakers.

Measuring background knowledge and text comprehension are issues that researchers who use native speakers have dealt with. However, for the most part, studies with nonnative speakers have used subjects where the background knowledge of the subjects could be assumed to be either high, for example, the procedure for washing clothes, or low, for example, the historical background of Halloween. This may allow for rival hypotheses (e.g., Carrell, 1983b), since the assumptions about subjects' background knowledge might be wrong. Being able to measure background knowledge would help eliminate rival hypotheses

in such studies. (In addition to mistaken assumptions about levels of background knowledge, manipulating background knowledge by using different texts may result in confounding variables, such as the difficulty level of the text.)

Studies using a second language, especially at beginning or intermediate levels of proficiency, present problems not faced in studies using the subjects' native language. It goes without saying that in measuring background knowledge or comprehension of a text, it is necessary that the method measure only what the researcher is interested in measuring. Nonnative speakers present special problems in this area. For example, if a method of measurement requires writing skill or reading skill on the part of the subject, subjects of low proficiency may appear less knowledgeable than they actually are or may appear to comprehend the text less well than they actually do.

Methods of Assessing Background Knowledge. Since language ability is likely to be an issue, one possibility would be to test subjects' background knowledge in their native language. While this would eliminate the possibility of subjects' second language proficiency interfering with their ability to express what they know,

there are likely to be practical problems. If all subjects are from the same native language background, and if help is available for writing material and for coding in that language, this is a possibility. However, there are often not enough subjects available from one language background, so subjects from several language backgrounds are used. This makes it impractical to test subjects' background knowledge in their native language. In such cases, or if, for some other reason, the researcher chooses not to measure background knowledge in the subjects' native language(s), a method of measurement must be chosen that minimizes confounding of the measurement of background knowledge with level of reading or writing proficiency.

Taylor (1979) and Stevens (1980) used multiple choice questions to assess background knowledge of subjects. Spilich, Besonder, Chiesi, and Voss (1979) used completion items. These both are possibilities for testing the background knowledge of nonnative speakers. They share the advantage of being simple to score. However, one problem is that good multiple choice and completion questions are not easy to write. Multiple choice questions require carefully written alternatives so that the correct response is clearly correct but that

distractors sound plausible. The stems of completion items must be clearly written so that it is clear what the expected answer is. A valid, reliable instrument also requires extensive pretesting (Heaton, 1975).

Another problem is that unless the researchers are very careful to make sure that the language within the reading ability of the subjects, the issue of whether reading ability influenced the results is likely to arise. For completion items, responses must not require active vocabulary beyond subjects' proficiency. If there is a high correlation between the measure of background knowledge and of comprehension of the text, this might be attributed to the possibility that both measures are measuring reading ability rather than to a correlation between background knowledge and comprehension.

The free association method of assessing background knowledge was originally developed by Langer (1980, 1981) as part of a prereading activity called the Pre Reading Plan (PReP). Langer and Nicolich (1981), Langer (1984), and Hare (1982) further developed the procedure as a measure of prior knowledge. In this procedure, the subjects are given three key content words or phrases related to a topic and asked to write anything that comes to mind when they hear each word or phrase. Responses are

categorized by coders into three categories according to the amount of prior knowledge that they indicate--much (3 points), some (2 points) or little (1 point). (Langer developed specific criteria for each category.) Scores were averaged for the three words or phrases. Langer and Nicolich (1981) reported intercoder reliability of .82. They found that these measures of prior knowledge were highly correlated with comprehension of the text and had no significant relationship with measures of IQ. Hare (1982) used the same procedure and found similar results. Hare reported an interrater reliability of .90.

While this procedure has some drawbacks for measuring the background knowledge of nonnative speakers, it also has some advantages. A major advantage of this method is that it requires very little reading. As long as care is taken to choose key concept words that the subjects will know, reading ability should not influence the results. Another advantage is fairly high intercoder reliability, which might be difficult to achieve in methods that required more writing.

This method of measuring background knowledge is more cumbersome to score than multiple choice or completion items. The main drawback is that it does require writing. However, the writing it requires can be fairly minimal,

only a few phrases or sentences for each key concept word. If coders can judge the quality of the responses of nonnative speakers, independent of their writing ability, this problem may be at least partially overcome. The most serious problem would still be with beginning readers, who may not be able to express their knowledge of the concepts at all, resulting in lower ratings than they should receive.

While Langer's free association method has not, to my knowledge, been used as a measure of background knowledge with nonnative speakers, I think it is a promising measure, at least for subjects with an intermediate to advanced level of proficiency in the target language.

Assessing Reading Comprehension. Methods of assessing reading comprehension have the same problems that measures of background knowledge have. Stevens (1980, 1982) and Langer (1984) used multiple choice questions, and these have the same advantages and disadvantages mentioned above. Hare (1982) used short answer questions. For nonnative speakers, these would have the disadvantage of requiring writing and of being more difficult to score than multiple choice or completion items.

Nunan (1985) used a cloze procedure to test

comprehension. He does not go into detail about choice of words for deletion. Obviously, the choice of words for deletion would be very important. An advantage of using the cloze procedure is that comprehension of different types of things could be checked by deleting different types of words. For example, cohesive ties could be deleted to test comprehension of cohesive relationships. A disadvantage, however, is that it would be difficult, though probably not impossible, to test subjects' inferences from a text using the cloze method. Since drawing inferences seems to be a particular problem in material from another culture, it is important that the method of assessing comprehension be able to assess ability to draw inferences from a text.

A more customary way of assessing comprehension in schema theory research is through recall protocols (e.g., Fass and Schumacher, 1981; Spilich, Besonder, Chiesi, and Voss, 1979; Kintsch and Greene, 1978). For high intermediate and advanced subjects, this is probably not a problem, as long as coders are not influenced by writing ability in their judgments about comprehension. For subjects with lower proficiency, this is more of a problem, since they may be entirely unable to express some of the concepts that they actually did understand.

Assessing Schema Activation. In doing research related to reading and schema theory with nonnative speakers, questions of whether a schema was activated, or which schema has been activated, may be raised. Results of studies using native speakers provide some information about how schemata operate when they are activated. Some of these studies may be useful in developing measures of whether schemata have been activated.

Studies by Pichert and Anderson (1977) and Anderson and Pichert (1978), and Fass and Schumacher (1981) suggest a technique that might be useful in answering this question. They had subjects read a story in which a house was described. Half of the subjects were asked to read the story as if they were potential homebuyers; the other half were asked to read it as if they were burglars planning on breaking into the house. When asked to recall the passage, subjects recalled more pieces of information that were important from the perspective that they had been told to use in encoding the passage (e.g., for the homebuyer, that the basement was damp and musty and the house needed a new roof; for the burglar, that the house was not visible from other houses and that a side door was left unlocked during the day).

Similarly, Kozminsky (1977) had subjects read

passages with different titles. Subjects tended to recall more propositions from the point of view suggested by the biasing title.

The results of these studies might be applied to the question of whether a schema had been activated by nonnative speakers using a similar method. Subjects could be instructed to encode a passage from one perspective or another. Readers who recalled significantly more propositions related to the perspective they had been assigned would be considered to have activated that schema. If there was no difference in the number of propositions for the two perspectives, the schema was not activated. Researchers might even be able to analyze the propositions that were produced to see if they did match a particular schema. While it might be difficult to identify this schema with certainty, this analysis might at least point the researchers in certain directions. Since this method of research has never been applied to nonnative speakers, research is necessary to see how nonnative speakers do perform in these circumstances.

Bransford and Johnson (1972) did a series of studies in which they presented subjects with a paragraph with a disambiguating context (in the form of a picture) given

before reading, after reading or not at all. Subjects who did not have a context or who were given the context after reading the passage remembered the passage less well than those who were given the context before reading the passage. Subjects who were not given a context from the beginning reported that, as they read, they did attempt to search for some schema that would make the paragraph meaningful.

These results, with a modification, might be useful in determining whether a schema had been activated. Rather than being given no context at all, subjects could be given an incorrect context, for example, in the form of a title that did not fit the content of the paragraph. However, the content of the paragraph should make it clear not only that the title does not fit but what the paragraph is actually about. After reading the paragraph, subjects could be asked what the paragraph was about.

Subjects who responded it was about what the title claimed it was about apparently did not activate that schema. Subjects who responded that they did not know what the paragraph was about had probably activated the schema suggested by the title, and therefore realized that text did not fit that title, but were unable to activate the correct schema. In other words, such subjects would

have attempted top-down processing and found that the input did not fit it. Presumably, bottom-up processing was attempted but was unsuccessful, as in Bransford and Johnson's (1972) subjects, who reported that they attempted to find a schema if none was given, but were unsuccessful. Subjects who responded correctly would be assumed to have activated the schema suggested in the title, attempted to use it in top-down processing, realized that it did not fit, and activated the correct schema based on bottom-up processing.

It would be interesting to compare the amount remembered from the text by subjects from these three groups. The group that activated the correct schema would be expected to remember the most propositions, as did the subjects given a context before reading the text in Bransford and Johnson (1972). The group that activated the title schema might remember the second highest number of propositions. While research has not been done specifically on this question, even with native speakers, subjects might deal with propositions that do not fit the schema in the same way that they do atypical propositions. Graesser, Woll, Kowalski, and Smith (1980) found that even slightly atypical propositions were more memorable to subjects than typical propositions. If the same process

applies, propositions that do not fit the schema may be tagged and therefore be easy to retrieve. Subjects that did not activate either schema would probably remember the least, just as Bransford and Johnson's subjects who were not given the context before reading the text.

Again, this method needs to be investigated, using both native and nonnative speakers. However, it has promise as a method of distinguishing those readers who activate a schema from those who do not and helping to identify strategies used by different readers.

Methodological Standards

Because of the complex issues related to measurement in research in the area of schema theory and reading with nonnative speakers, it becomes important to set methodological standards for this research. In this section, I would like to propose some standards suggested by the considerations discussed in the previous section.

Measuring Background Knowledge. The first criteria is that researchers should measure rather than assume the background knowledge of subjects from other cultures.

In the case of research with native speakers, especially related to event schemata, background knowledge is sometimes assumed (e.g., Bransford and Johnson, 1972; Taylor, 1979). In studies using middle class, white

American subjects, this may be justified, since event schemata seem to be highly conventionalized within a culture (Bower, Black, and Turner, 1979). However, assumptions about schemata are more difficult to make when using subjects from other cultures (or even subcultures of American culture). Therefore, it is important for researchers to either measure the schemata of the members of other cultures.

This may be done in a variety of ways, for example, by using questions, by asking subjects to list the steps in an event schemata (as Bower, Black and Taylor [1979] did), or by use of informants from that culture. (In the latter case, researchers must be careful to use informants from the same ethnic and social group as the subjects for the research, since schemata might differ among different groups.) Researchers should also be cautious about combining subjects from different cultures, since their schemata may differ. (This may be a practical problem for researchers in English-speaking countries, since it is often difficult to find a sufficient number of subjects from the same country.)

Measurement Instruments. The second criteria is that instruments used to measure schemata and reading comprehension should take into account the language

proficiency of the subjects.

As with any other measures used in research, measurement instruments used in reading and schema theory research with nonnative speakers should be reliable and valid. It goes without saying that measures should be pretested to help insure this.

Of particular concern with nonnative speakers are the reading and writing proficiency required. For example, a researcher using multiple choice questions must be concerned about the reading proficiency required to answer the question, while one using recall protocols must be concerned about writing proficiency, both in terms of the subjects' ability to express themselves and the coders' ability to judge content apart from grammatical errors.

Measuring Activation of Schemata. The third criteria is that researchers should consider instruments that include some measure of whether the appropriate schema has been activated.

In the last section, two methods were suggested by which activation of schemata could be measured. Since there may still be some question about the degree to which nonnative readers make use of schemata, researchers might include measures of whether readers have activated a schema. (In addition, more research is necessary on the

measures of schema activation.) This would hopefully lead to a greater understanding of how nonnative speakers use schemata.

Prereading Activities. The fourth criteria is that researchers doing studies related to prereading activities in the classroom should avoid confounding the treatment conditions that they use.

While Hudson (1982) made an important contribution to understanding of the effect of prereading exercises, questions remain because it is not clear which of the elements of the prereading activity caused the effects that Hudson found. Researchers who do future studies in this area should operationalize the variables should design prereading activities in a way that would allow them to determine which element(s) of the activity caused the results that were found.

Measurement of Language Proficiency. The fifth criteria is that researchers should measure the reading proficiency of subjects and use it as a variable.

Previous studies have shown differences in results for readers of different levels of proficiency (e.g., Carrell, 1983b and Hudson, 1982). Future researchers should measure the reading proficiency of subjects.

Conclusions

Implications for Second Language Readers

Research on schema theory in general and its application to reading in second language speakers in particular has important implications for the second language classroom. Studies show that readings with an unfamiliar background, including an unfamiliar cultural background, are more difficult to understand. Understanding inferences and relationships among different pieces of information is a particular problem, for both native and nonnative speakers.

This indicates that in reading classes for second language speakers, teachers and materials developers should take these findings into account. The findings have implications in three major areas: 1) choice of materials, 2) helping students activate schemata, and 3) helping students deal independently with materials with an unfamiliar background. I will discuss each of these briefly.

Choice of Materials. Johnson (1981) found that familiarity of the cultural background of a text had a greater influence on comprehension than did language complexity. While it is not appropriate to ignore language complexity entirely in choosing materials, this

indicates that familiarity of the background of materials should be a major factor in decisions about choices of reading materials, especially at lower levels of language proficiency.

Helping Students Activate Schemata. Students may have some difficulty activating their schemata independently. Hudson (1982) found that students at the beginning and intermediate levels who experienced a prereading activity specifically intended to activate a schema did better than students who did other prereading activities. These results indicate that prereading activities are important, especially at the beginning and intermediate levels. However, more research needs to be done to refine knowledge about what is necessary in such prereading activities and what other activities might be useful.

Preparing Students to Read Independently. The previous section raises another issue--how well do techniques for activating schemata in a classroom setting transfer to independent reading? Students cannot always read in the classroom, and it is vital that the reading classroom prepare them for reading outside of the classroom. Can second language students be taught to do prereading preparation that will help them activate the

schemata that they need to use? To answer these questions, more research is needed, preferably over a period of time. Hudson's prereading technique might be modified so that students are taught to look at the title, subheadings, etc., from a text, think about what they know about the subject, and make predictions about what is likely to be included in the text. Carrell (1985) found that students could be taught to identify the textual schema for a text, and that this helped them comprehend the text better. Possibly a similar technique would work for content schemata.

Schema theory and its implications are a fruitful area of research for those interested in second language learning. More research is necessary in an attempt to answer some of the questions raised in this paper.

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